

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
27 September 2001 (27.09.2001)

PCT

(10) International Publication Number  
**WO 01/71306 A1**

- (51) International Patent Classification<sup>7</sup>: G01M 15/00, H04B 1/38, H04Q 7/24      (74) Agent: LEE, Jun-seo; KCL, 10th Floor, Korea Coal Center, 80-6 Susong-dong, Chongro-ku, Seoul 110-727 (KR).
- (21) International Application Number: PCT/KR01/00420      (81) Designated States (*national*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
- (22) International Filing Date: 16 March 2001 (16.03.2001)
- (25) Filing Language: Korean
- (26) Publication Language: English
- (30) Priority Data:  
2000/13860      18 March 2000 (18.03.2000) KR
- (71) Applicant (*for all designated States except US*): GLOBAL ENGINEERING AND TECHNOLOGY [KR/KR]; 179-180, Gumi-dong, Bundang-ku, 463-800 Seongnam-si, Kyunggi-do (KR).
- (71) Applicant and  
(72) Inventor: CHO, Hyung-ki [KR/KR]; Unit 102-1804 Dongmun Apartment, 690, Pungduckchun-ri, Suzi-woop, 449-575 Youngin-si, Kyunggi-do (KR).

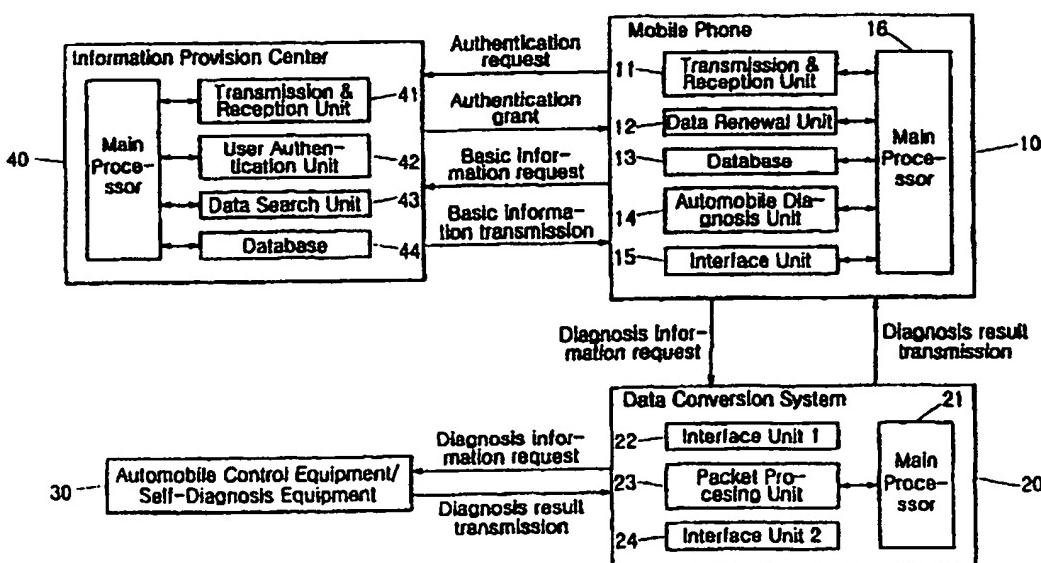
(84) Designated States (*regional*): AR IPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

**Published:**

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: VEHICLE DIAGNOSTIC SYSTEM AND METHOD USING MOBILE TELECOMMUNICATION SYSTEM



(57) Abstract: The invention relates to a system and a method for a self diagnosis of vehicle using a mobile telecommunication system. The system comprises an information center system for providing basic information for a diagnosis of vehicle; a mobile telecommunication terminal for diagnosing the current vehicle status on the basis of the basic information from the information center system and the information regarding current vehicle status which are stored in control units at the vehicle and for displaying the results of the diagnosis; and a data transforming system for data communication between the mobile telecommunication terminal

WO 01/71306 A1

## VEHICLE DIAGNOSTIC SYSTEM AND METHOD USING MOBILE TELECOMMUNICATION SYSTEM

### 5 TECHNICAL FIELD

The present invention relates to the automobile self-diagnosis system and method using a mobile telecommunication device. In particular, the present invention relates to the automobile self-diagnosis system and method using a mobile telecommunication device, which analyzes the automobile's abnormality through the 10 mobile telecommunication device, provides the relevant repair information, and renews the relevant information by upgrading through the radio channel the basic information on the trouble analysis of a new type automobile or any changed basic information on the trouble analysis.

### 15 BACKGROUND ART

Automobiles generally have the electronic control equipment such as the engine control equipment, transmission control equipment, break control equipment, suspension control equipment, etc. The said electronic control unit receives information on the automobile's status from sensors installed in the relevant parts of the automobile, 20 analyzes the automobile's status through such information and controls the relevant parts of the automobile based upon the analysis result so that the automobile may be maintained in the optimum conditions. Such information on the automobile's status is stored in each electronic control equipment or in a separate memory means, the self-diagnosis unit.

equipment or the self-diagnosis unit is analyzed by a separate scanner which contains examination data and the data for each type of automobiles.

Thus, in order to have the automobile repaired using the stored automobile status information, a user must take the automobile to a repair shop having the specialized equipment, such as the said scanner, for capturing the relevant information. Furthermore, in order to conduct a correct diagnosis of the abnormality of an automobile or the troubled part of the automobile using the captured information, expert knowledge in connection with the captured information is required.

If new type automobiles are out on the market, the automobile repair shop must purchase the expensive diagnosis equipment, new scanner, or upgrade the old scanner with the relevant data because the preexisting scanner would not have the diagnosis data regarding the new automobiles. Additional expenses will be incurred for such purchase or upgrading of the scanner and such expenses will result in the increase of the repair charges. Moreover, it will take a long time to upgrade the relevant data and to apply such data to the diagnosis and repair of automobiles. Additionally, because the data are different for each type of automobiles, expert knowledge is required for the use of the said scanner.

Recently, the number of Internet sites providing information on the automobile trouble diagnosis is rapidly increasing. A driver clicks the item corresponding to the trouble detected in his automobile from various diagnosis items displayed on the screen of an Internet site or inputs the trouble symptoms and receives the relevant opinion or measures to be taken by e-mail or facsimile.

However, in order to have one's automobile status diagnosed through these Internet sites, the driver must have the exact knowledge on where in his car the trouble has occurred. Also, even with the information on the remedial measures sent from the

Internet sites, a driver may not effectively take the relevant measures unless he has specialized knowledge on the automobile. Thus, the usefulness of the information would be limited.

Additionally, in order to utilize the diagnosis methods provided by the conventional Internet sites, a user must have an account at the relevant Internet site or must be in the condition where the user may read e-mail or bulletin board of the relevant site. Moreover, in the conventional automobile diagnosis methods, it is difficult to exactly know the reception place of the information requested by the user and the status of automobiles currently in motion may not be diagnosed.

10

## DISCLOSURE OF INVENTION

In order to resolve the above-described problems, the present invention, using a mobile telecommunication device (e.g., cellular phone, PCS, PDA, electronic organizer, etc.), analyzes whether the subject automobile has any abnormality and provides the appropriate repair method information. Furthermore, the present invention makes it possible to download new diagnosis information required for the diagnosis of any new type automobile, newly added diagnosis information and repair method information from the information provider through radio channels, so that such information may conveniently be utilized.

20        Additionally, the automobile's status information collected during the driving is analyzed real time so that the appropriate measures may be expeditiously taken for any abnormality of the automobile occurring during the driving.

Thus, the present invention provides the automobile self-diagnosis system using a mobile telecommunication system comprising: the information provision center system which provides registered subscribers with basic information required for the automobile

diagnosis; the automobile control equipment/self-diagnosis equipment which collects and stores the status information of automobiles in motion; the mobile telecommunication device which sets up the database with the basic information for the automobile diagnosis received from the said information provision center system,  
5 diagnoses the relevant automobile's status based upon the automobile's status information received from the said automobile control equipment/self-diagnosis equipment and outputs the diagnosis result; and the data conversion system which converts data in order to make the data communication methods of the said mobile telecommunication device and the said automobile control equipment/self-diagnosis  
10 equipment compatible with each other.

The said information provision center system preferably comprises: the transmission and reception unit which receives signals from the said mobile telecommunication device and transmits relevant information to the said mobile telecommunication device; the user authentication unit which determines whether to grant the right to use the service by analyzing signals of requesting the use authentication transmitted from the said mobile telecommunication device; the database which contains the basic information for the diagnosis of each type and each part of automobiles and the information on the said mobile telecommunication device subscribers; the data search unit which accesses relevant data in the said database according to the request from the said mobile telecommunication device; and the processor which controls all the actions taken for the operation of the said information provision center system.  
20

When basic diagnosis information for new type automobiles or renewed diagnosis information is stored in the said database, the said information provision center system processes the relevant information into SMS/TWF messages and transmits  
25

such information to the said mobile telecommunication device of the registered subscriber through paging channels.

The said mobile telecommunication device comprises: the transmission and reception unit which transmits or receives audio or written data and receives SMS/IWF

- 5 messages of the basic information for the automobile diagnosis from the information provision center system; the database which stores the basic information on the automobile diagnosis received from the said information provision center system; the data renewal unit which renews and stores in the database the diagnosis information for new type automobiles or other new diagnosis information, and the result of diagnosis on
- 10 the subject automobile; the automobile diagnosis unit which conducts the diagnosis based upon the automobile status information received from the said automobile control equipment/self-diagnosis equipment; the interface unit which interfaces the automobile status information transmitted to or received from the said automobile control equipment/self-diagnosis equipment; and the processor which controls all the actions
- 15 conducted for the automobile diagnosis.

The said data conversion system comprises: the first interface unit which transmits and receives encrypted packet data while connected to the said mobile telecommunication device; the second interface unit which transmits and receives information to and from the said automobile control equipment/self-diagnosis equipment

- 20 by the K-line or L-line communication method; the packet processing unit which encrypts or decrypts the packet data communicated with the said mobile telecommunication device; and the processor which controls all the actions conducted for the data communication between the said mobile telecommunication device and the said automobile control equipment/self-diagnosis equipment.

25 The said data conversion system may be a separate module embedded into the

said automobile control equipment/self-diagnosis equipment or may be a separate module which can be attached to and detached from the said mobile telecommunication device.

Additionally, the present invention provides the automobile self-diagnosis method using a mobile telecommunication device comprising the steps of: connecting the mobile telecommunication device to the automobile control equipment/self-diagnosis equipment through the data conversion system and then converting the mode of the said mobile telecommunication device to the automobile diagnosis mode; determining whether the basic diagnosis information for the subject automobile is contained in the database by searching the database of the said mobile telecommunication device; sending to the said automobile control equipment/self-diagnosis equipment the request for the automobile status information through the said data conversion system if the basic diagnosis information for the said subject automobile is contained in the database; diagnosing the automobile status using the automobile status information received from the said automobile control equipment/self-diagnosis equipment and the basic diagnosis information contained in the said mobile telecommunication device's database; and outputting the diagnosis result and the repair method information through the said mobile telecommunication device.

According to the present invention's diagnosis method, the said diagnosis result and repair method information may be transmitted to and outputted through the device specified by the user of the said mobile telecommunication device at any designated time.

Also, the said mobile telecommunication device may output the information on the subject automobile's diagnosis history at the option of the user.

The present invention's diagnosis method further comprises the steps of:

receiving the authentication for the service provision by connecting the said information provision center system automatically if it is determined that the basic diagnosis information for the selected automobile of the user is not contained in the said mobile telecommunication device's database or if the relevant information has been lost or  
5 damaged; and, when the authentication for the service provision is granted from the said information provision center system, requesting the basic diagnosis information, downloading the relevant basic diagnosis information and then storing the information in the said mobile telecommunication device's database.

According to the present invention, if the automobile diagnosis mode is selected  
10 in the automobile during the driving through the mobile telecommunication device, the diagnosis result may be outputted to the driver immediately, upon the analysis of the automobile's status detected real time from the subject automobile.

#### BRIEF DESCRIPTION OF DRAWINGS

15 Fig. 1 is a block diagram illustrating the structure of the present invention's automobile self-diagnosis system using a mobile telecommunication device.

Fig. 2 is a flow chart illustrating a preferred implementation of the automobile self-diagnosis using a mobile telecommunication device according to the present invention.  
20

#### BEST MODE FOR CARRYING OUT THE INVENTION

Reference will now be made in detail to the preferred implementation of the present invention as illustrated in the accompanying drawings.

As shown in Fig. 1, the automobile self-diagnosis system using a mobile  
25 telecommunication device according to the present invention comprises: the mobile

telecommunication device (10), the data conversion system (20), the automobile control equipment/self-diagnosis equipment (30) and the information provision center (40).

The said mobile telecommunication device (10) is connected to the information provision center system (40) through the radio connection and receives the basic diagnosis information on the subject automobile from the information provision center system (40). Also, the mobile telecommunication device (10) receives the automobile status information from the automobile control equipment/self-diagnosis equipment (30), diagnoses the automobile's status based upon the received basic diagnosis information and the said automobile's status information, and notifies the driver of the diagnosis result by voice or written messages. In the said mobile telecommunication device (10), an application program for the automobile diagnosis is installed and the automobile diagnosis items are set up by each detailed sub-item unit or in its entirety in the database. The said mobile telecommunication device (10) downloads the diagnosis items for the new type automobile and renewed diagnosis items, and upgrades the database with such downloaded information. Any ordinary mobile telecommunication device such as a cellular phone, PCS, PDA, etc. may be the said mobile telecommunication device (10).

The said data conversion system (20) is installed in the automobile or in the mobile telecommunication device (10) as a separate module. Connected to the automobile control equipment/self-diagnosis equipment (30) and the mobile telecommunication device (10), the data conversion system (20) enables the mobile telecommunication device (1) and the automobile control equipment/self-diagnosis equipment (30) with different communication methods to perform the stable data transmission and reception.

The said automobile control equipment/self-diagnosis equipment (30) checks the automobile status during the driving, collects the automobile's status information and

stores the collected automobile's status information in the database. More specifically, the said automobile control equipment/self-diagnosis equipment (30) is equivalent of the automobile's engine control equipment, transmission control equipment, suspension control equipment, break control equipment and/or other separate module in the self-diagnosis unit.

The said information provision center system (40) is a system providing the basic diagnosis information required for the diagnosis of automobile's status. The information service provider is equipped with such system for the provision of the service. The said information provision center system (40) also provides new diagnosis items regarding new type automobiles and new information on the automobile diagnosis and/or repair methods as well as the basic automobile diagnosis information and repair method information. The information provision center system (40) may provide the information for fee or free of charge. Now, the detailed structure of each system will be explained in the following.

The said mobile telecommunication device (10) transmits and receives the automobile status information upon processing the information into SMS (Short Message Service) / IWF (Inter Work Function) messages by the CDMA (Code Division Multiple Access) telecommunication method through the radio channel (i.e., the paging channel). In particular, the said mobile telecommunication device (10) includes the transmission and reception unit (11), the data renewal unit (12), the database (13), the automobile diagnosis unit (14), the interface unit (15) and the main processor (16).

The main processor (16) of the said mobile telecommunication device (10) controls all the actions related to the radio mobile communication such as the transmission/reception of written or voice messages through the relay of cell sites. Also, the said main processor (16) controls the transmission/reception of the basic

automobile diagnosis information, the reception of the new information from the said information provision center system (40) and the upgrade of the database according to the received information.

The transmission and reception unit (11) of the said mobile telecommunication device (10) is composed of RF modules. The transmission and reception unit (11) conducts the transmission and reception of the voice or written radio mobile communication PCM (Pulse Code Modulation) data.

The data renewal unit (12) of the said mobile telecommunication device (10) upgrades the data with the new information received from the said information provision center system (40), renews the general status information of the automobile presently subject to the diagnosis by the date and the time, and renews the diagnosis history of the subject automobile accordingly.

The database (13) stores the general data required for the radio mobile communication, all the information required for the automobile status diagnosis, backup information, renewed data and the diagnosis result information on the subject automobile in the relevant address area.

The automobile diagnosis unit (14) analyzes the automobile status information received from the automobile control equipment/self-diagnosis equipment (30) and the data conversion system (20) using the basic diagnosis information stored in the database and determines whether there is any abnormality in the subject automobile. Furthermore, the automobile diagnosis unit (14), at the same time as it outputs the diagnosis result and/or repair method information as voice or written messages through the mobile telecommunication device (10), renews the diagnosis result stored in the database address for the diagnosis result.

25 The interface unit (15) is connected to the data conversion system (20) for the

serial communication interface such as RS-232 and enables the data communication with the automobile control equipment/self-diagnosis equipment (30) to be conducted in the serial communication method.

The said data conversion system (20) includes the main processor (21), the first 5 interface unit (22), the packet processing unit (23) and the second interface unit (24).

The main processor (21) of the said data conversion system (20) controls the action to convert the mobile telecommunication device (10)'s diagnosis information request signals to those of the K-line or L-line communication method which may be transmitted to the automobile control equipment/self-diagnosis equipment (30) and the 10 action to convert the automobile status information received from the automobile control equipment/self-diagnosis equipment (30) by the K-line or L-line communication method to the data which may be interfaced in the serial manner.

The first interface unit (22) is connected to the interface unit (15) of the mobile telecommunication device (10) to enable the data communication between the mobile 15 telecommunication device (10) and the data conversion system (20) to be conducted through the serial interface.

The packet processing unit (23) decrypts the encrypted packet data of the diagnosis information request from the mobile telecommunication device (10) and encrypts and generates packets from the automobile status information received from the 20 automobile control equipment/self-diagnosis equipment (30) so that such information may be transmitted to the mobile telecommunication device (10).

The second interface unit (24) transmits the automobile status information request signals through the serial interface such as the RS-232 to the automobile control equipment/self-diagnosis equipment (30) by the K-line or L-line communication method 25 and receives the automobile's status information provided from the automobile control

equipment/self-diagnosis equipment (30) by the K-line or L-line communication method.

The information provision center system (40) includes the transmission and reception unit (41), the user authentication unit (42), the data search unit (43), the database (44) and the main processor (45).

5       The transmission and reception unit (41) of the said information provision center system (40) receives signals from the Internet/on-line connectable mobile telecommunication device (10) and transmits the relevant information to the mobile telecommunication device (10).

10      The user authentication unit (42), upon receiving the use authentication request signals from the mobile telecommunication device (10), conducts the authentication function by analyzing the information regarding the relevant device, i.e., the subscriber's registration number and password, etc., retrieved from the database (44), determining whether the information provision service may be provided after deciding whether the user is a registered subscriber.

15      The data search unit (43) searches the database (44) for the basic diagnosis information requested by the mobile telecommunication device, which has been permitted to use the information provision service.

20      In order to receive the service of providing basic diagnosis information for each part of automobiles and other basic information, the database (44) stores in the relevant address area the data regarding registered subscribers of the mobile telecommunication device (10) such as subscribers' registered numbers and passwords.

25      For the provision of the basic diagnosis information for the mobile telecommunication device (10) registered in the information provision center system (40), in the event that basic diagnosis information for a new type automobile is added in the database (44), the main processor (45) of the information provision center system

(40) accesses the registered mobile telecommunication device (10) through the radio channel, i.e., paging channel, and enables the basic trouble diagnosis information for the relevant automobile type to be downloaded by transmitting SMS/IWF messages.

Now, the procedures taken for diagnosing any abnormality in automobiles  
5 according to the present invention are explained with references to Fig. 1 and Fig. 2.

The procedure taken to conduct the voice or written data communication using the mobile telecommunication device (10) through the relay of cell sites is the same as the action of the conventional mobile telecommunication devices. Thus, the explanation of such procedure is omitted here.

10 In order to diagnose the status of a parked or moving automobile, the data conversion system (20) is interfaced with the automobile control equipment/self-diagnosis equipment (30) and thus the data communication system among the mobile telecommunication device (10), the data conversion system (20) and the automobile control equipment/self-diagnosis equipment (30) is established (STEP STEP S101). In  
15 the said mobile telecommunication device (10), the basic diagnosis information regarding the subject automobile is stored in the database (13).

The user converts the mode of the said mobile telecommunication device (10) to the automobile diagnosis mode (STEP STEP S102) and selects the type of the automobile and the part of the automobile to be diagnosed. The main processor (16) of  
20 the mobile telecommunication device (10) executes the relevant application program which searches the database (13) and determines whether the database (13) contains the basic diagnosis information for the relevant automobile type and the part of the automobile to be diagnosed (STEP STEP S103, STEP STEP S104).

If it is determined that the said database (13) does not contain the basic diagnosis  
25 information on the relevant automobile or that the existing information has been

damaged, the main processor (15) accesses the information provision system (40) via the radio channel using the transmission and reception unit (11) (STEP STEP S110). When the mobile telecommunication device (10) and the information provision center system (40) are connected through the radio communication method, the user 5 registration number and password are inputted to request the service provision authentication for the downloading of the basic diagnosis information.

Then, in response to the mobile telecommunication device (10)'s authentication request received through the transmission and reception unit (41), the user authentication unit (41) of the information provision center system (40), by the control of the main 10 processor (45), searches the database (44) to determine whether the relevant mobile telecommunication device (10) is registered and the correct password was inputted and thus determines whether the relevant user is a registered subscriber.

If it is determined that the mobile telecommunication device (10) is that of a registered subscriber, the authentication is granted so that the basic diagnosis 15 information may be downloaded (STEP STEP S111). When the request for the provision of the basic diagnosis information arrives from the mobile telecommunication device (10), the basic diagnosis information for the relevant automobile is extracted from the database (45), processed by the SMS/TWF or other specified method, and transmitted to the mobile telecommunication device (10).

20 In contrast, if it is determined that the mobile telecommunication device (10) is that of a user not registered as a subscriber, a question is sent to ask whether the user wants to be registered. If the user wishes to be registered as a subscriber, the user's mobile telecommunication device (10) is registered through simple registration process for the acquisition of user number, password, and other information. Then the 25 requested basic diagnosis information is provided.

If the user is a registered subscriber but the inputted password is wrong, the request for another input of the correct password is made. If wrong passwords are continuously inputted on more than certain specified number of occasions, the connection with the mobile telecommunication device (10) is forced to be cut off.

5       If the database of the mobile telecommunication device (10) in the automobile diagnosis mode contains the relevant basic diagnosis information for the subject automobile, the main processor (16) of the mobile telecommunication device (10) encrypts the signals requesting the automobile status information into certain packet forms and transmits such packets to the data conversion system (20) connected through  
10      the interface unit (15) for the interface such as RS-232 (STEP STEP S105).

The automobile status information request signal from the said mobile telecommunication device (10) is inputted to the data conversion system (20) through the first interface unit (22). The main processor (21) of the data conversion system (20) decrypts the received automobile status information request signal through the packet processing unit (23) and transmits such signal to the second interface unit (24). The second interface unit (24) converts the decrypted automobile status information request signal to the K-line or L-line communication data which may be transmitted to the automobile control equipment/self-diagnosis equipment (30) and transmits such converted data to the automobile control equipment/self-diagnosis equipment (30).

20       According to the automobile status information request signal received from the data conversion system (20), the automobile control equipment/self-diagnosis equipment (30) extracts the status information regarding the relevant parts of the automobile, which was collected as a result of the diagnosis conducted during the driving, converts such information into K-line or L-line communication data, and transmits the converted data  
25      to the data conversion system (20).

The main processor (21) of the data conversion system (20) converts the automobile status information received from the automobile control equipment/self-diagnosis equipment (30) through the second interface unit (24) into serial data, processes the converted data into packet forms in accordance with the communication method of the mobile telecommunication device (10) through the packet processing unit (23), encrypts such packet data and then transmits them to the mobile telecommunication device (10) through the first interface unit (22).

The main processor (16) of the mobile telecommunication device (10) receives the data from the data conversion system (20) through the interface unit (15) (STEP 10 STEP S106), decrypts the automobile status information, and then diagnoses whether there is any abnormality through the automobile diagnosis unit (14) (STEP S107, STEP S108).

The automobile diagnosis unit (14) analyzes the automobile's status information using the basic diagnosis information stored in the database (13) and diagnoses whether 15 there is any abnormality in each part of the subject automobile (STEP S109). Thereafter, the diagnosis result and repair method information is delivered to the driver as written or voice information through the mobile telecommunication device (10) and the diagnosis result is stored in the database (14), renewing the preexisting record.

The diagnosis result concerning the automobile's status may also be transmitted 20 through the information provision center system (40) to other devices designated by the user, such as a facsimile machine or an ordinary telephone.

According to the present invention, the above-described diagnosis process may be conducted not only while the subject automobile is parked but also while the automobile is in motion. Accordingly, because any abnormality in the automobile may 25 be diagnosed and the appropriate repair method may be notified real time immediately

after any trouble occurs in the automobile, necessary measures for the automobile's trouble may be taken expeditiously.

If new type automobiles are out on the market, the basic diagnosis information for such new type automobiles is newly registered in the database (44) of the information provision center system (40). The main processor (45) of the information provision center system (40) processes the newly registered basic diagnosis information into SMS messages and then transmits the SMS/TWF messages regarding the basic diagnosis information to the mobile telecommunication devices (10) registered as subscribers for the service through the paging channel so that such information may be stored in the database (13) of each mobile telecommunication device (10). Also, if new repair method is developed for an existing automobile type, the basic information regarding such new repair method is transmitted in the above-described manner so that such information may also be stored in the database (13) of the mobile telecommunication device (10). Therefore, when new type automobiles are manufactured, the relevant basic diagnosis information may conveniently be upgraded. Furthermore, new repair method may also be easily utilized.

The radio communication channel connection between the mobile telecommunication device (10) and the information provision center system (40) may be achieved by using the conventional mobile telecommunication service network or by establishing a separate telecommunication network. However, the conventional mobile telecommunication service network is preferred.

As described in the foregoing, the present invention, by diagnosing the automobile's status using a mobile telecommunication device, makes it possible to conveniently and expeditiously determine the existence of any automobile trouble. Furthermore, as well as employees of a repair company and experts, ordinary drivers

may also diagnose the automobile's status and obtain the appropriate repair method information. Resultantly, automobiles may be repaired and maintained at a low cost according to the present invention.

Particularly, in the event that new type automobiles are out on the market or  
5 automobile diagnosis information is upgraded, the information regarding the relevant automobile is easily upgraded. Thus, all the information users may obtain information regarding new automobiles without incurring special economic burden.

Moreover, without using the expensive scanner for the automobile diagnosis,  
automobiles may be diagnosed using the conventional mobile telecommunication device.  
10 Therefore, the expenses required for the diagnosis may be reduced.

Especially because the mobile telecommunication device which may conduct the radio communication is used in the present invention, the automobile status may be diagnosed, the result be analyzed and relevant countermeasure be taken real time not only when the automobile is parked but also when the automobile is moving.

**WHAT IS CLAIMED IS :**

1. An automobile self-diagnosis system using a mobile telecommunication device comprising:
  - 5 an information provision center system which provides a registered subscriber with basic information for the diagnosis of the subject automobile;
  - an automobile control equipment/self-diagnosis equipment which collects and stores the automobile status information during the driving;
  - 10 a mobile telecommunication device which stores in the database the basic information for the automobile device received from the said information provision center system, diagnoses the relevant automobile's status using the automobile status information received from the said automobile control equipment/self-diagnosis equipment and the basic information for the automobile diagnosis, and outputs the result of such diagnosis; and
  - 15 a data conversion system which converts the data communicated between the said mobile telecommunication device and the said automobile control equipment/self-diagnosis equipment for the compatible data communication of the mobile telecommunication device and the automobile control equipment/self-diagnosis equipment.
- 20
2. The automobile self-diagnosis system using a mobile telecommunication device according to claim 1, wherein the said information provision center system comprises:
  - a transmission and reception unit which receives signals from the said mobile telecommunication device and transmits certain information to the said mobile telecommunication device;
  - 25 an user authentication unit which analyzes the use authentication request signals transmitted from the said mobile telecommunication device and determines whether to grant the authentication for the service provision;

a database which stores the basic information for the diagnosis of each type of automobiles and each part of automobiles, and the information concerning the subscriber of the said mobile telecommunication device;

- 5        a data search unit which searches the said database and accesses the relevant information based upon the request from the said mobile telecommunication device; and
- a processor which controls all the actions taken for the operation of the said information provision center system.

10      3.        The automobile self-diagnosis system using a mobile telecommunication device according to claim 1, wherein, if the basic diagnosis information for any new type automobile or renewed basic diagnosis information is newly stored in the said database, the said information provision center system processes the relevant information into SMS/TWF messages and transmits such messages to the said mobile telecommunication device of the registered subscriber through the paging channel.

15

4.        The automobile self-diagnosis system using a mobile telecommunication device according to claim 1, wherein the said mobile telecommunication device comprises:

20      a transmission and reception unit which transmits and receives voice and written data through the relay of cell sites and the basic information for the automobile diagnosis to and from the said information provision center system;

          a database which stores the basic information for the automobile diagnosis received from the said information provision center system;

25      a data renewal unit which renews the basic information for diagnosis of new type of automobiles or other new basic diagnosis information, and results of the diagnosis conducted for the subject automobile and stores such renewed information in the database;

          an automobile diagnosis unit which conducts the diagnosis based upon the automobile status information received from the said automobile control equipment/self-

diagnosis equipment;

- an interface unit which conducts the interface actions for the automobile status information request signals transmitted to the said automobile control equipment/self-diagnosis equipment and the automobile status information received from the said 5 automobile control equipment/self-diagnosis equipment; and
- a processor which controls all the actions taken for the diagnosis of the subject automobile.

5. The automobile self-diagnosis system using a mobile telecommunication device 10 according to claim 1, wherein the said data conversion system comprises:

- a first interface unit which transmits and receives encrypted packet data while connected to the said mobile telecommunication device;
- a second interface unit which transmits and receives information to and from the said automobile control equipment/self-diagnosis equipment in the K-line or L-line 15 communication method;
- a packet processing unit which encrypts or decrypts the packet data communicated with the said mobile telecommunication device; and
- a processor which controls all the actions taken for the data communication between the said mobile telecommunication device and the said automobile control 20 equipment/self-diagnosis equipment.

6. The automobile self-diagnosis system using a mobile telecommunication device according to claim 1 or claim 5, wherein the said data conversion system, as a separate module, is installed in the said automobile control equipment/self-diagnosis equipment.

25

7. The automobile self-diagnosis system using a mobile telecommunication device according to claim 1 or claim 5, wherein the said data conversion system is a separate module which may be attached to or detached from the said mobile telecommunication

device.

8. The automobile self-diagnosis method using a mobile telecommunication device comprising the steps of:

5. connecting the mobile telecommunication device to the automobile control equipment/self-diagnosis equipment through the data conversion system and then converting the mode of the said mobile telecommunication device to the automobile diagnosis mode;

10 determining whether the basic diagnosis information for the subject automobile is contained in the database by searching the database of the said mobile telecommunication device;

15 sending to the said automobile control equipment/self-diagnosis equipment the request for the automobile status information through the said data conversion system if the basic diagnosis information for the said subject automobile is contained in the database;

diagnosing the automobile status using the automobile status information received from the said automobile control equipment/self-diagnosis equipment and the basic diagnosis information contained in the said mobile telecommunication device's database; and

20 outputting the diagnosis result and the repair method information through the said mobile telecommunication device.

9. The automobile self-diagnosis method using a mobile telecommunication device according to claim 8, wherein the said diagnosis result and repair method 25 information is transmitted to and outputted through the device specified by the user of the said mobile telecommunication device at the designated time.

10. The automobile self-diagnosis method using a mobile telecommunication

device according to claim 8, wherein the said mobile telecommunication device outputs the diagnosis history information on the subject automobile for a certain specified period of time.

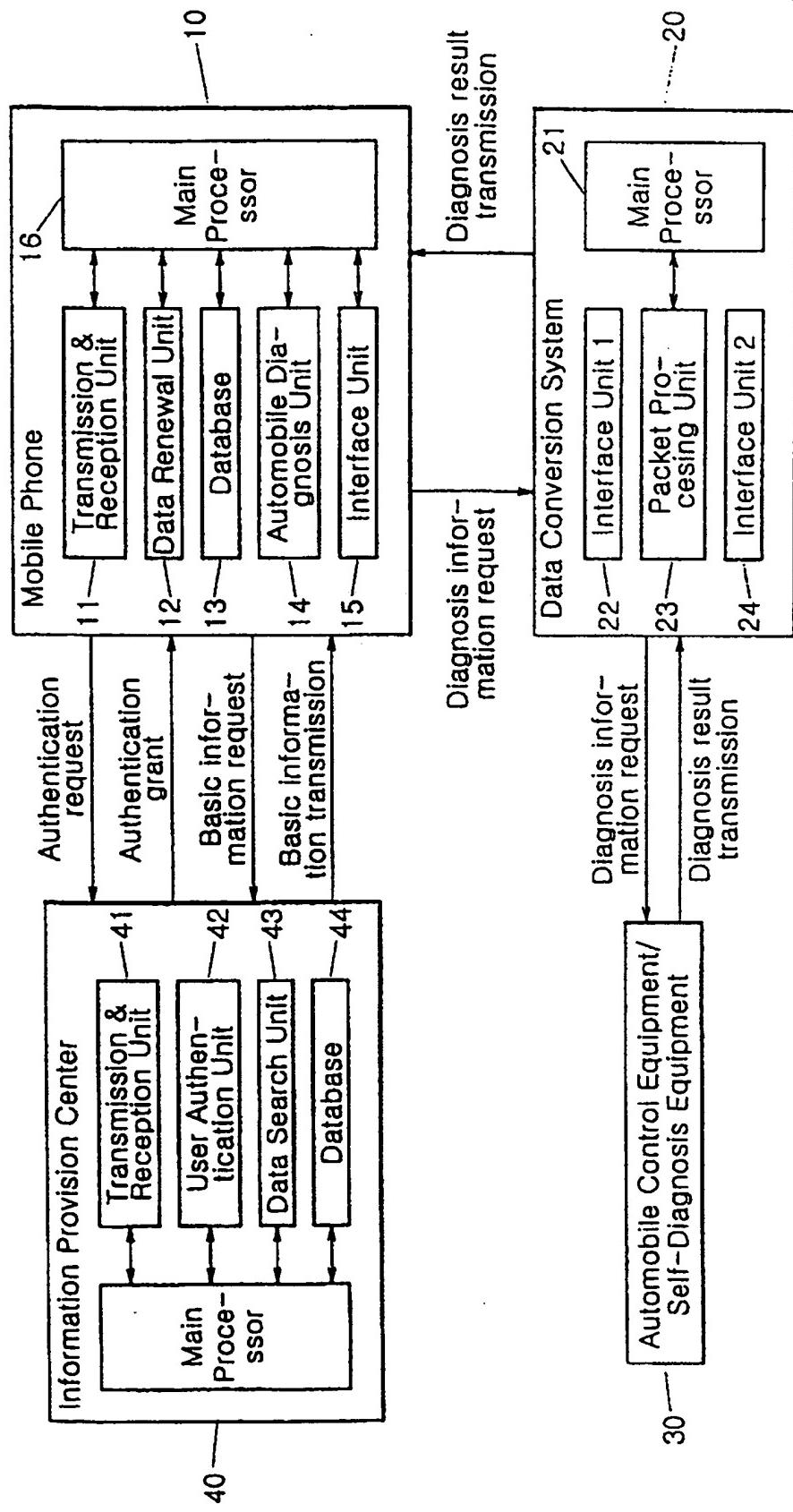
- 5    11.    The automobile self-diagnosis method using a mobile telecommunication device according to claim 8, further comprising the steps of:

obtaining the authentication for the service provision by connecting the said information provision center system automatically if it is determined that the basic diagnosis information for the selected automobile of the user is not contained in the said  
10    mobile telecommunication device's database or if the relevant information has been lost or damaged; and

if the authentication for the service provision is granted from the said information provision center system, requesting the basic diagnosis information, downloading the relevant basic diagnosis information and then storing the information in  
15    the database of the said mobile telecommunication device.

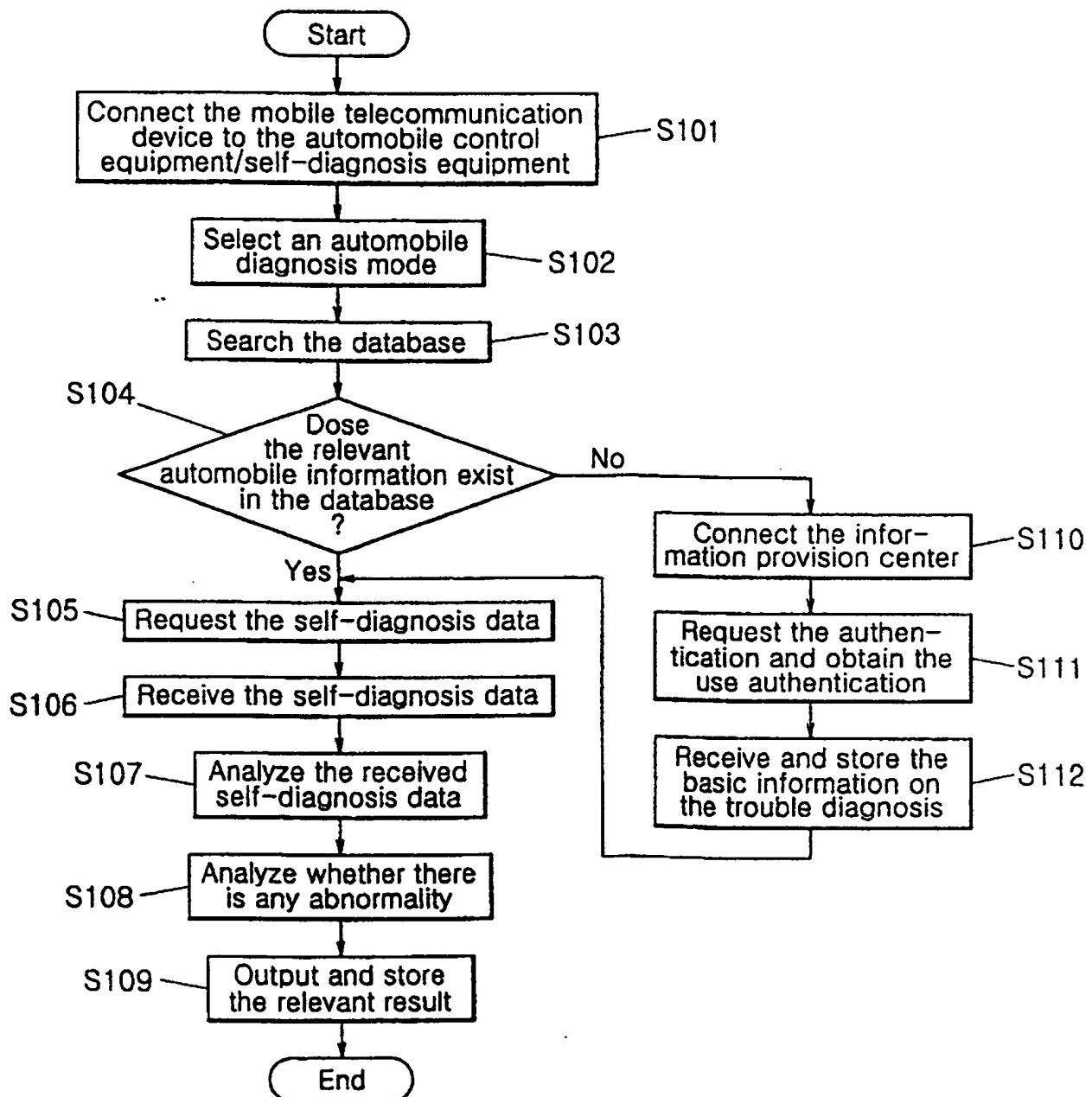
12.    The automobile self-diagnosis method using a mobile telecommunication device according to claim 8, wherein, if the automobile diagnosis mode is selected in the automobile during the driving through the mobile telecommunication device, the subject  
20    automobile's status information is analyzed real time and the diagnosis result is outputted to the driver.

Fig. 1



2/2

Fig. 2



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR01/00420

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7 G01M 15/00, H04B 1/38, H04Q 7/24,

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

G01M 15/00, H04B 1/38

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

KR, JP : IPC as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

NPS(remote, wireless, diagnosis, vehicle)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5542553 A (MOTOROLA) 15 AUGUST 1995, see claims	1-12
Y	EP 754940 A2 (HEWLETT-PACKARD COMPANY) 22 JANUARY 1997, see abstract	1-12
A	US 6023232 A (DAIMLERCHRYSLER AG) 8 FEBURARY 2000, see Claims NO.4	1-12
A	US 6029508 A (SNAP-ON TECHNOLOGIES, INC.) 29 FEBURARY 2000, see whole document	1

 Further documents are listed in the continuation of Box C. See patent family annex.

"A"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family
"P"	document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search

27 JUNE 2001 (27.06.2001)

Date of mailing of the international search report

29 JUNE 2001 (29.06.2001)

Name and mailing address of the ISA/KR  
Korean Intellectual Property Office  
Government Complex-Daejeon, Dunsan-dong, Seo-gu, Daejeon  
Metropolitan City 302-701, Republic of Korea

Facsimile No. 82-42-472-7140

Authorized officer

BAE, Soon Goo

Telephone No. 82-42-481-5742

